

IITA Bulletin

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News from NASA

Intercenter Working Group Happenings

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The Learning Technologies Project is continuing to evolve. Two new centers are joining the LTP roster beginning in FY98 — Marshall Space Flight Center and Kennedy Space Center.

All LTP center education outreach groups are preparing proposals for FY98. A one-page summary of plans for next year is due Friday, August 22. These summaries

will be posted on the Web so that centers can view each other's plans. Then, during the September 10 Intercenter Working Group videoconference, centers will have a chance to comment on one another's proposed plans, looking particularly for areas of collaboration. Final proposals are due to the Project Office on Wednesday, September 24. Guidance on what should be included in the proposals has been posted to the Intercenter Working Group mail list. Funds for center activities will total \$1.9 million in FY98.

Five center education outreach groups and Education Division representatives at headquarters participated in two telephone conferences to discuss the Learning Technologies Channel (LTC). Conceived by

the Ames LTP group, LTC is an Internet infrastructure for the delivery of content and activities. In the past, the infrastructure allowed people to attend conferences from their own desktops and to experience the conference almost as if they were there. All the telecon participants added new and creative ideas to the increasingly exciting possibilities for the LTC. On September 3 and 4 there will be short sessions for interested center education outreach groups to practice using the array of technologies that comprises LTC. On September 8 and 9 the same groups will have the opportunity to discuss possibilities for LTC while actually using those Internet technologies. Watch the Intercenter Working Group list for details.

Upcoming HPCC/IITA Events

September 10 Intercenter Working Group Videoconference 8:00 a.m.-10:30 a.m. (Pacific time)

October 18-19 Association of Science-Technology Centers Convention St. Louis, Missouri

November 5 Intercenter Working Group Videoconference 8:00 a.m.-11:00 a.m. (Pacific time)

Oct. 31-Nov. 1 Area National Science Teachers Association Convention Pittsburgh, Pennsylvania

November 13-16 TEL-ED '97 Austin, Texas, and Mexico City, Mexico

November 15-22 SC '97: High Performance Networking and Computing San Jose, California

News Bytes

RSPAC Is Available for Web Site Test and Evaluation

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Just a reminder — RSPAC offers Web page test and evaluation software to CATs. This software, appropriately named MoNsTeR!, will traverse a Web site and perform the following automated tests:

Link Verifier: This test verifies that each link on a Web page goes to a valid element, such as another URL (internal or external to a site), a graphic file, a sound file, etc.

HTML Verifier: This test checks the HTML

code for each Web page. Weblint, which checks for adherence to the HTML standards, is used to generate a report of errors found.

Download Time Verifier: This test reports the time needed to transmit a complete Web page, including all of its graphic elements.

Search Engine Verifier: Six of the most popular search engines (WebCrawler, Lycos, AltaVista, Yahoo!, Excite, and Infoseek) will be visited and searched to see if the Web site is listed within the top 100 entries on that Web page.

In addition to the automated tests, RSPAC provides the following manual testing:

Copyeditor Review: This is a less formalized test that RSPAC's copyeditor can perform on a site. A representational section of

(continued on page 2)

News Bytes (Cont.)

tion) is reviewed by the copyeditor for grammatical and punctuation errors, as well as for inconsistencies in style.

Page Rendering: A RSPAC reviewer will view a site under various browsers (Netscape, Internet Explorer, WebTV, etc.) and operating systems (Windows, Mac, UNIX, WebTV, etc.) and look for pages that render so badly that the intent of the page is lost.

For a more detailed description of the test and evaluation process, visit <http://developers.ivv.nasa.gov/tech/tne/tne.html>

CAT in the Spotlight

Behind the Scenes at Mars Pathfinder Mission Operations

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After twenty-one years (as a former Viking Meteorology Science Team member) it's great to be back on Mars! Unless you reside on the other side of Mars, (i.e., out of touch with current events), it's obvious that Mars Pathfinder was a major technological and scientific success. The science returns have far exceeded anyone's dreams, especially when considered in the context of initially suggested goals. The earliest plan I can remember was that up to 90% success would be attributed to getting the rover off the ramp, making a couple of measurements with its Alpha-Proton-X-ray Spectrometer, taking a lot of images, acquiring some atmospheric data, and surviving a week! Strong inputs to NASA HQ from the science community helped extend these goals, while project and engineering staff worked hard to make this far more than a "Technology Demonstration" mission.

Although this was a scientifically far less complex and encompassing mission than Viking, its operation was very difficult

NASA's Observatory Hires Assistant Curator

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Joanie Straub has been named assistant curator for NASA's Observatory Web site, RSPAC officials have announced.

As assistant curator, Ms. Straub will work closely with Dr. Joe Gardner, curator of the site, and the entire Web production team. The deputy curator's specific responsibilities include supervision of the graduate assistantship and internship programs and overseeing content development for NASA's Observatory, among others.

"Joanie's presence will greatly benefit the entire Observatory team," said

Dr. Gardner. "We will draw upon her many skills and experiences to meet the challenging goals of our ever-expanding Web site."

A native of Springfield, MO, Ms. Straub is a 1994 graduate of the University of Missouri, with bachelor's degrees in broadcast journalism and history. Her prior professional experience includes stints as a television news producer and reporter in Columbia, MO, and as an international travel director for Fortune 500 companies.



due to the tight integration of the IMP (Imager for Mars Pathfinder) camera and the Sojourner rover operations. IMP had to acquire images to define the hazards and objects for investigation, and the rover operations team had to plan and execute the commands within one day or less during the first few sols (Martian days). Contrast this with the orderly three- to seven-sol planning schedule of Viking! During the first several sols, data were received, processed, and analyzed, decisions were made, and rover commands were relayed while the NASA Deep Space Network tracking facilities on Earth were visible from the Pathfinder site on Mars. These operations were complicated by the one-way light (transmission) time of ten minutes or greater. The science teams and staff proficiently performed these feats, and as they gained experience they were able to increase the nominal data rates to up to four times the guaranteed values and double the maximum rates.

Four workstations were generously provided for the program by Digital Equipment, three of them as powerful or far more powerful than our Web server. Data were moved by Jim Tillman from the project machine to one of the DEC Alpha machines in the same area. This machine provided his operational resources at JPL and a conduit

for data to his large DEC 9000-300 server at the University of Washington (UW); it crunched the data, archived results, produced graphics, and distributed them to the server purchased for the program, as well as to mirrors. Dr. Harry Edmon and Mr. David Warren configured these workstations and developed scripts for system-to-system procedures, supported operations, and helped solve problems.

Our educational and public infrastructure, targeted for Web viewers, simultaneously supported important science activities. Extensive procedures, software, and interfaces were developed by Neal Johnson to automatically calibrate the data, display multiple plots for editing and approval, integrate them into our Web pages, and ship them to others. Automatically updating mirror sites and transferring data to Dr. Soren Larsen at the Danish National Laboratory in Roskilde, Denmark, for scientific analysis was accomplished. Neal had to modify, test, and implement procedures on the fly, even though we had previously tested procedures during Operational Readiness Tests. One consequence of cheaper, faster is that more unexpected problems will arise! With this fast transfer of data, initial spectral analysis of the temperature data was com-

(continued on page 3)

CAT in the Spotlight (Cont.)

pleted by Dr. Larsen in Denmark and presented to the science team less than three weeks after the beginning of the mission.

Meteorology data were acquired and converted from raw spacecraft numbers by converting the programs of Dr. Tim Schofield, Atmospheric Structures/Meteorology Science Team leader, to the S+ statistical language. The temperatures at the three levels were displayed fifty-one times per sol throughout the first week. As during the Operational Readiness Tests, the first Martian low-rate meteorological observations were extracted from the database automatically and on schedule. Later, Jim Tillman at JPL and Neal Johnson at University of Washington and at home spent considerable time adapting to some operational problems. Subsequently, the Web page was enhanced to display animated sol-by-sol frames of Pathfinder's diurnal temperature variations. The development of the daytime, unstable, and nighttime, stable, atmospheric surface layer was graphically demonstrated by the temperature measurements at 0.25, 0.5, and 1.0 meters on the meteorology mast. Included were comparisons of the Viking Lander 1 data for the same season, sol by sol.

Jim Tillman developed background information for Mars in general, its climate (as illustrated by his 3.3 year Martian climate record) and atmospheric temperatures (including diurnal and seasonal aspects), and characteristics of great Martian dust storms. Summary Viking meteorological data for the complete Viking mission were simplified by volunteer George LeCompte and linked by Neal Johnson. Several major descriptive components were developed or extensively rewritten, and specially modified data sets were added right up to landing on July 4. These are referenced in the links below.

A component of this program was the installation of a display at the Smithsonian National Air and Space Museum (NASM). A severe reduction in staff earlier this year jeopardized this component, but the system was installed in the exhibit area less than two weeks before July 4!

July 4 began with the automated procedures working perfectly on the first

downlink and immediately thereafter. The temperature data were presented graphically in several formats. We added an animated GIF displaying complete sols of data one at a time while a commentary was added to provide periodic descriptions of the mission and meteorology status.

July 4 began with UW Grayskies, RSPAC, NASM, and Florida State providing mirroring. As the volume grew, Grayskies began to falter since it was the machine referenced from the JPL Web page. (It topped out at about 55,000 requests per hour. Requests ignore graphics calls and those from our machines and correspond to ~ 110,000 hits.) Webmaster David Dubov eased the pressure by pointing to two of our sites simultaneously, and we encouraged people to use our mirror sites. (Effective redirection is an important aspect of future Web applications and extensions.) Hundreds of compliments were received, and many can be classified as rave reviews. User locations ranged from next door to Katmandu; responses from Mars have yet to be detected.



During the early part of the mission, computer resets interrupted data collection and relay to Earth. This was reported as a meteorology problem, but it was a system bug which reared its ugly head when meteorology requested long data sequences. During debugging of this problem in the JPL "test bed" system, and until the software patch was installed on Pathfinder, meteorology was shut off during daytime operations, causing some of the gaps in the first thirty sols. Once meteorology resumed operating throughout the sol, the high data rates allowed the scheduling of fast sampling once every four seconds for a complete sol. This fast sampling and the very high resolution of Pathfinder provided unique insights into Martian meteorology. As with other inves-

tigations, continued data collection and analysis continue to provide major science returns, as well as new puzzles, from this low-cost mission.

At the end of the nominal thirty-day mission, a meeting was held to evaluate the condition of Pathfinder's battery and to decide on its future utilization. (Both the lander and rover can operate on solar power alone.) It was decided to charge the battery to its fullest capacity and carefully use it to acquire meteorology data one out of every five nights; during the other four, the lander would operate on solar power alone, relaying its data in the afternoon. At the end each transmission, the computer would be shut down and all data in the volatile RAM (Random Access Memory) would be lost: we are now in that operational mode. The positive side of the new operational mode is that on every fifth sol, meteorology observations are made continuously at four- or one-second intervals.

Testing, mirroring, and suggestions by RSPAC staff have been very valuable during this development. Extensive support was provided by the Mars Pathfinder staff and colleagues. Project Manager Tony Spear supported and encouraged this effort, as did Dr. Cheick Diarra. David Dubov, Pathfinder Webmaster, and Dr. Robert Anderson generously assisted by linking Pathfinder pages to ours and sharing resources. Science and operational team members provided advice, support, and data. Professor Peter Smith, PI, and Dr. Justin Maki of the Pathfinder IMP team were especially helpful. The support and assistance of Dr. John T. Schofield of the Atmospheric Structure/Meteorology Team was critical to our success. Finally, the initiative and support of NASA's Information Infrastructure Technology and Applications (IITA) project, High Performance Computing and Communications (HPCC) program, Office of Aeronautics is greatly appreciated.

This summary of our July Web use is provided by Dr. Harry Edmon.

Site	Est. Inquiries	Total Hits
UW	2,235,486	9,864,775
RSPAC	61,445	236,981
NASM	67,480	257,836
FSU	7,714	33,480

(continued on page 4)

CAT in the Spotlight (Cont.)

"Est. Inquiries" tries to estimate the actual number of inquiries by ignoring requests for button and small graphics. Two-and-one-half days of data for UW are missing, so the actual number of inquiries is probably around 2,280,000, and hits around 10,100,000.

Data collection, display, and supporting information development are con-

tinuing and we suggest that "Live from Earth and Mars" is a success. One teacher said that parents had never seen their children as excited about science, fulfilling a goal of mine begun twenty-five years ago to share science and engineering directly with students. I hope to obtain support to continue to provide Pathfinder data throughout the mission, to continue the development of these resources and materials, and to extend "Live from Mars" to other missions. Potential collaboration, discussions, and support are welcome. We will be replying to comments for

the foreseeable future and sample responses will be made available. Links to new or recently modified information can be found at the URLs listed below.

Mars (NEW)

http://www-k12.atmos.washington.edu/k12/resources/mars_data-information/mars_overview.html

Mars: Atmospheric Pressure: Overview (NEW)

http://www-k12.atmos.washington.edu/k12/resources/mars_data-information/pressure_overview.html

Atmospheric Temperature: Overview (NEW)

http://www-k12.atmos.washington.edu/k12/resources/mars_data-information/mars

All about CATs

Public Connection Developing "Space Update" CD-ROM

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The Public Connection has been extremely busy, working toward developing a CD-ROM product, Space Update, for commercialization. Space Update software continues to be fully uploaded at six kiosks in the Houston Museum of Natural Science, with over 500,000 visitors estimated so far. Full uploading is also being done at the Rice School (K-8), Watson Lake Science Center, and NASA/Langley. The Visitor Center at the Air Force Academy will be online this fall, and negotiations are ongoing with four other museums for uploading services. The software is also showing in intermittent-upload mode at the Electric Space exhibit (presently in South Carolina).

The last planetarium show, Northern Lights, is being packaged for distribution to other planetariums.

Two-week Internet camps were offered for students this summer, as well as Internet after camp for all summer campers at the Houston Museum of Natural Science.

The Windows version of the Space Update CD-ROM is finished and tested, and is now being distributed. Over 400 CDs have been distributed to teachers and museums for testing. Negotiations are being conducted with two publishers for national CD distribution. Copies were given to the Eisenhower organization for testing and

archiving in that system.

The Public Connection worked with Geoff Haines-Stiles of the Live from Mars project to host a live uplink from the Houston Museum of Natural Science in July.

The domains spaceupdate.com and mtpe.com have been purchased to help in commercialization. One programmer has been released to stretch remaining funds as long as possible.

Telescopes in Education Project Lets Students Work from the Classroom

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The Telescopes in Education (TIE) project offers the opportunity for K-12 students and educators to remotely control a twenty-four-inch telescope on Mount Wilson from their classrooms.

Students involved in the project have also performed simple projects such as The Zoo of the Universe, in which the students collected images of objects within our galaxy and outside of our galaxy, then formed a family tree of the objects. Other students have done photometry on variable stars and tumbling asteroids. The system will be accessible through either Internet or modem later this year. Additional information is available on the homepage located at <http://tie.mtwilson.edu>

Aviation Academy 2000 Gears Up for New School Year

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The month of August was a quiet one for the Wooddale Aviation Academy 2000 program at Wooddale High School in Memphis. The beginning of the month was spent finalizing the Teacher Training Workshop schedule. Plans were made for the Wooddale Aviation Advisory Meeting, with over thirty-five guests anticipated. Teachers return to school on August 18, student registration begins August 19, and school begins on August 25.

The Wooddale Aviation Teachers' Workshop went well, and the new teachers are becoming familiar with the teaching centers, each of which is equipped with an IBM computer, an Epson printer, a 32" color monitor, and a VHS stereo recorder/player.

LDAPS Conducts Teacher Workshops, Produces CD-ROM and Movie

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The LEGO Data Acquisition and Prototyping Systems (LDAPS) at Tufts University had a busy July, conducting three teacher workshops (two in Massachusetts, one in California) and developing a beta CD-ROM and a ten-minute movie overview of the program.

(continued on page 5)

All about CATs(Cont.)

The CD-ROM, the project's first, gives an in-depth overview of the program, along with the drivers, instruction on HTML, and more. It is currently available only in the Mac version and at the FTP site. The movie can also be viewed at <http://ldaps.ivv.nasa.gov> in the "What's New" section.

Other July achievements included:

- * An introductory workshop in Massachusetts (with teachers from Massachusetts, North Carolina, and Virginia) that included nineteen participants. The teachers rated it very highly (see EDCATS). The contents of the workshop, along with pictures and more, are on the Web.

- * Conducted a Year Two workshop for one week that allowed last year's teachers to improve their Web-authoring skills and learn to use the new LabVIEW drivers. Members of the staff also traveled to California to conduct a similar two-week workshop there.

MCET Updates Web Site to Serve All Browsers, Announces Other Recent Developments

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The Massachusetts Corporation for Educational Telecommunications (MCET) spent July dedicating its Web site (<http://www.mcet.edu/nasa/>) to ensure full accessibility to the pages for users with different browser capabilities. All newly developed pages, even if the preferred standard remains Netscape 3 or later, are now updated for access with Netscape 2.x and Internet Explorer 2.x. Netscape 2.x users will access all pages with the correct visual layout and all internal and external links properly working. The Java-powered features will not be available, but no error messages will pop up on the screens. Internet Explorer 2.x users, who will access a separate set of pages, will experience some problems downloading graphics, animations, and QuickTime movies, but will

have total access to content, and all internal and external links will be properly connected. Text-based users will have access to the content and will be able to follow all links.

Work also continued on the "Career Album" with graphic support from RSPAC. The "Career Cards" page will look like a baseball card album, with a separate page for each career representative. Each card will have two sides, with a picture in the front and a personal career profile in the back, accessible by clicking on the image and flipping the card over. The e-mail addresses of the "career electronic guests" will be hyperlinked to facilitate communications with the students. All Take Off! Part II "Career Corner" guests were asked to answer "aviation careers in five questions." Having all guests follow the same scheme in writing their profiles helps to unify the content of the cards. All guests have committed to answering students' questions.

A new introductory page was developed for the history segment. The page will bring the users to two parallel sub-pages, "Aviation History Timeline" and "Notable People in Aviation." The Timeline and Notable pages are cross-linked and contain many links to external sites providing additional content support. The project director is researching copyright ownership for historical images to include on the page. Permissions should be secured before the end of August. Web development will continue in August.

The Annenberg/CPB channel will distribute a live, interactive workshop series nationwide for K-8 teachers of math through MCET Satellite Network. The workshops will be aired live twice on Tuesdays, October 14 through December 9, 1997, from 3:15 p.m. - 5:15 p.m., and again from 6:15 p.m. - 8:15 p.m., and rebroadcast on Thursdays from 11:00 a.m. - 1:00 p.m. (all times Eastern). The workshops are offered free of charge. Teachers who participate in the entire workshop series are eligible for two graduate credits from Colorado State University (in this case a \$90 tuition charge applies). Certificates of participation are also available.

The eight-part series will offer motivation and tools to pre- and in-service teachers who want to explore ways teach math. Using a variety of models, activities,

and video clips from the Annenberg math and science collection, participants will discuss ideas for teaching innovation with their colleagues across the country using telephone, fax, e-mail, and the World Wide Web.

MCET is recruiting participants interested in coordinating local groups of teachers to participate in these telecasts. Applicants should contact their local media specialist to learn whether they can receive the channel's digital Digicipher2/MPEG2 satellite signal, or if a local public access cable station offers the channel's programs in their community. Teachers interested in taking part in the workshops can contact Nicole Stark, the channel's audience acquisition specialist, at 800-556-4376 for additional information and resources, or visit the channel's Web site at <http://www.learner.org/k12/acpbtv> for information about programs and schedule.

Nothin'— but Net

Measuring Learning in Cyberspace: Testing the Effectiveness of the Internet as an Educational Tool

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Editor's note: The following article contains excerpts from a recent study conducted by RSPAC summer intern Nicholas Butcher, a senior at East Fairmont High School in West Virginia. Full copies of the study are available by writing jgardner@rspac.ivv.nasa.gov

The Internet is considered by many to be an educational resource. Vast sums of money have been spent to develop teaching materials, purchase hardware and software, and promote the use of the World Wide Web (WWW or Web) in the classroom, but little information is available concerning how much actual learning occurs during a session on a Web page. We know the Web is routinely used to impart concepts and facts

(continued on page 6)

Nothin' but Net (Cont.)

about complex processes. We also know that writing style, graphics, and navigation tools are important factors in the effectiveness of a Web site. Qualitative surveys have been conducted in attempts to understand these factors, but there are few reports on the results of quantitative analysis of how much information is actually retained after an article about a complex natural process has been viewed on the Web by an Internet user. This study examines that question; it seeks to measure the amount of information retained by a person visiting a Web site.

To accomplish this task, a Web article, also called an exhibit, was designed and implemented to test the hypothesis that significant amounts of complex information about unfamiliar phenomena can be learned from an effective Web site. The topic chosen was tsunamis, the large, often destructive water waves triggered by tectonic activity such as earthquakes.

This test article included content material, graphics, navigation techniques, and two questionnaires. Visitors, one hundred in all, were asked to answer five questions before reading the article. Afterward they were asked the same five questions to see what they had learned.

The data from the questionnaires were captured and placed in a database for

statistical analysis. Conclusions were based upon the results of the statistical tests.

Conclusion and Recommendations

This experiment has shown quantitatively that the Web can be an effective learning tool. The results have shown that a significant positive difference in knowledge about a natural process can be demonstrated and measured based on this Web article. If used properly, the Web has the potential to become one of the most valuable educational tools available.

The results of this project also indicate that the following procedures should be considered while creating an education-based Web exhibit:

- Keep pages short and precise. State only what is necessary and avoid repetition.
- Make the page user-friendly and attractive through simple graphics that will limit the need for long paragraphs of text. Don't scare away a learner with long, text-only pages or by using difficult-to-understand language.
- Have the article edited by more than one person. It is best to get as many opinions as possible on all aspects of an article.

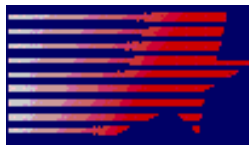
- Don't force a reader to infer anything. Tell them everything they need to know.
- Make very clear at the beginning of the article everything you want a person to learn, stated in simple language. Don't lose concepts in long sentences.

The importance of the last two items became clear when the *data from the* pre- and post-tests were reviewed. More people answered question 2 correctly on the pre-test than the post-test. Furthermore, on question 3 the same number of people answered correctly on both tests.

Further analysis revealed that the concepts that these questions were asking about had been confusing and difficult to understand. When this is the case, people begin to get lost in the words and leave the exhibit, which is a less-than-desirable outcome of a Web article. Avoid this by making concepts clear.

This project has quantitatively demonstrated the usefulness of the Web and its potential as a learning tool. A number of concepts about the Internet must still be studied to learn how to create more effective learning-based environments in cyberspace. Through additional projects like this one, can learn how best to use the Web to educate in the future.

If you would like to be on the IITA Bulletin mailing list, please send e-mail to Scott Gillespie at: sgillespie@rspac.ivv.nasa.gov, or write to: BDM/RSPAC, 100 University Drive, Fairmont, WV 26554. Phone: (304) 367-8324, fax: (304) 367-8211.



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